Name: _____ Date: _____ Core: _____

Land and Sea Breezes Lab

LT1: I can collect experimental data using temperature probes and a Vernier LabQuest.
LT2: I can use that data to predict the occurrence of land and sea breezes.

Part 1: Collecting Data

1. Set up the Vernier LabQuest
   a. Go to experimental set-up. Make sure that Probe 1 is in sand (land) and Probe 2 is in water.
   b. Turn on the Vernier LabQuest.
   c. Select LabQuest App from main menu.
   d. Click on Mode. Mode should be Time Based.
   e. Check to be sure you are collect 2 samples/sec and that the sample interval is 0.5sec.
   f. Change the duration to 15 min. and click DONE. Now click OK.

2. Turn light on

3. Record the daytime data
   a. Press the record (green) button in the lower left hand corner of the screen.
   b. Record your starting temperature for each land and water in your table.
   c. Collect the data for 15 min.
   d. While waiting: DEAR.
   e. When the run ends turn off the lamp.
   f. Select Graph → Store run
   g. Record ending daytime temperature in your table
   h. Find the overall daytime temperature increase by subtracting the starting temperature from the ending temperature and record this in your table.

4. Record the nighttime data
   a. Press the record (green) button in the lower left hand corner of the screen.
   b. Record the starting temperature for each land and water in your table.
   c. Collect the data for 15 min.
   d. Select Graph → Store run
   e. Record ending nighttime temperature in your table.
   f. Find the overall nighttime temperature increase by subtracting the starting temperature from the ending temperature and record this in your table.

5. If there is time spend some time looking at the graph and analyze options on the LabQuest.

Data Table: The Effect of Time on Temperature for Land and Water

Surface Type	**Starting Daytime Temp**	**Ending Daytime Temp.** *(highest temp)*	**Overall Daytime Temp. Increase**	**Starting Nighttime Temp.** *(right after you turn off light)*	**Ending Nighttime Temp.**	**Overall Nighttime Temp. Decrease**
Land *(sand)*						
Water						

Part 2: Data Analysis

Directions: Use the data collected on the Vernier Labquest to answer the following questions.

1. According to your data, which surface type was **warmed faster** by the sun, land or water?

   _____

2. As surface materials are warmed by the sun, they in turn warm the air above them. As the sun shines during the day, is the air above the beach or the water warmer? **How much warmer is it?**

   _____

3. **Use Figure 3** *(below)* **to complete the following tasks**.

   a. Based on your answer to Question 3, and knowing that warm, less dense air rises and cool, denser air sinks, **place arrowheads** on the two vertical lines in Figure 3 indicating the general direction of air movement over the sand and the water **<u>on a sunny day</u>**.

   b. The two vertical arrows you have drawn form the basis of a circular convection current. Now **draw two horizontal arrows** that complete the path of the wind in this convection current.

Figure 3 - A sunny day at the beach

4. Imagine yourself standing on the beach in the diagram above. According to the arrows you drew, where would the breeze be coming from?

   _____

5. Knowing that winds are named for the place that they originate, is this a sea breeze or a land breeze?

   _____

6. According to your data, which material **cooled faster**, land or water?

   _____

7. As surface materials cool, they in turn cool the air above them. After the sun goes down and the warm surfaces cool, is the air above the land or the water warmer? **How much warmer is it?**

   _____

8. **Use Figure 4** *(below)* **to complete the following tasks.**
    a. Based on your answer to Question 7, and knowing that warm, less dense air rises and cool, denser air sinks, place **arrowheads** on the two vertical lines in the diagram indicating the general direction of air movement over the sand and the water **after the sun goes down**.

    b. The two vertical arrows you have drawn form the basis of a circular convection current. **Draw two horizontal arrows** that complete the path of the wind in this nighttime convection current.

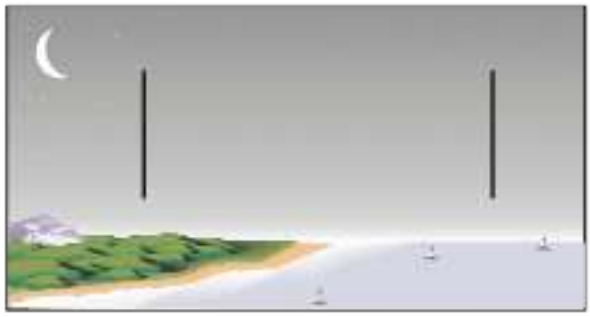

Figure 4 - An evening at the beach

9. Imagine yourself standing on the beach in the diagram above. According to the arrows you drew, where would the breeze be coming from? Is this a sea breeze or a land breeze?

_____

NOW… REALLY THINK ABOUT IT:

10. Imagine there are two coastlines. One has a large beach and then bare rocky desert land above the beach. The other has a forest above a small beach. If you stood on each beach, which beach would you expect more extreme winds during the day and night? **Explain your reasoning.**

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11. **The Eastern** side of the Columbia River Gorge is **very hot and dry in the summer**. The ground has few trees and a lot of bare rock. The <u>western side</u> of the Gorge is <u>warm in the summer, but not as hot</u>. There is forest covering almost all the land. The Columbia River also flows through the Gorge, a large body of water. Which direction would you expect a breeze to flow on a summer day through the Gorge? ***Explain your reasoning <u>using evidence/data from this lab</u>***.

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